

REMARKS

Further consideration of this application courteously is solicited. This Amendment is submitted pursuant to 37 CFR §1.114(c) as the accompanying submission with Applicants' concurrently-filed Request For Continued Examination. By this Paper, claims 1, 5, 6 and 12 are amended. All of claims 1-12 remain pending and active in this application.

Initially, the Examiner's grant of an interview in furtherance of the prosecution of this application has been appreciated. The interview took place on March 31, 2004. Claim 1 has been amended based upon the discussions during the interview. The amendments made to the dependent claims correspond to those made in claim 1 hereby.

The Examiner agreed that the clamp ring structure taught in Applicants' disclosure patentably distinguishes over that which is disclosed in U.S. Patent 5,711,815 to Lee, et al. For the record, it is noted that the same owner who has been assigned all of the rights in the present application and present invention also is the assignee/owner of the Lee, et al. patent.

A central point of discussion during the interview was amendment of the claims to positively recite the structural differences between Applicants' structure and that of Lee, et al.. As amended, claim 1 defines the gap-forming member as being "arranged above and overlapping the division wall via a second gap." Specifically, it is

the "outer peripheral portion" of the gap-forming member that overlaps the division wall and is separated therefrom by the second gap.

By way of review, in Applicants' exemplary, preferred embodiment of Figure 3, the clamp ring 40 corresponds to the "gap-forming member" recited in claim 1. From Figure 3, it is seen how the clamp ring 40 extends from the wafer W to overlap the bent portion 46 of the cylindrical division wall 44. Indeed, in the embodiment of Figure 3, the circumferential edge of the clamp ring 40 immediately is above that of the cylindrical division wall 44. With further reference to Figure 3, clamp ring 40 overlaps a peripheral edge portion of the wafer W by an overlapping width L1. Clamp ring 40 further overlaps the cylindrical division wall 44 and its bent portion 46 by overlapping width L2. A first height, or gap H1, separates clamp ring 40 from the upper face of the wafer. In the exemplary embodiment, the height of this first gap is defined by contact protrusions 48 provided on the clamp ring 40. On the left side of Figure 3, a gap with a second and larger height H2 separates the clamp ring 40 and the cylindrical division wall 44.

As also emphasized during the interview, Applicants' particular clamp ring structure with the overlapping widths L1 and L2, and the relative gap heights H1 and H2, provide for a particular inert gas flow from underneath the stage 24 (see Figure 1). As reviewed with the Examiner, the purpose of the inert gas, shown as argon (Ar) gas in Figure 3, is to prevent processing gas from entering behind the stage. Hence, argon gas is admitted via nozzle 56 (Figure 1), whereupon between the cylindrical

division wall 44 and the stage 24 (and the wafer), the argon gas divides into a split flowpath through each of gaps H2 and H1 as also depicted in Figure 3. The structure for accomplishing this split flowpath of the argon gas is the overlapping portion L2 of the clamp ring 40. Hence, due to the structure of the ring, a portion of the argon gas is conducted outwardly away from the wafer through gap H2. However, an albeit smaller portion of the gas is conducted inwardly with respect to the wafer across the face of the wafer through gap H1.

As discussed with the Examiner, Applicants current gap-forming member structure which purposely conducts a portion of the inert gas toward the wafer through gap H1 is not present or suggested by the Lee, et al. patent. By contrast, those of ordinary skill in the art are taught by Lee, et al. to direct the purged gas outwardly away from the wafer. For instance, see Figure 16 of Lee, et al. and the arrow showing purged gas flow through the gap F between the annular press ring portion 91 and the division wall projection 71a. The annular press ring portion 91 does not have or suggest Applicants' recited outer peripheral portion that overlaps (and is arranged above) the division wall. In the absence of such overlapping outer peripheral portion of the gap-forming member, "almost all" of the purged gas is directed outwardly away from the wafer through gap F as shown in Figure 16 of Lee, et al.¹ For these reasons,

¹ Column 11, lines 11-20 of Lee, et al. states that "...almost all of the purged gas flows outward from the peripheral edge portion of the wafer through the flowpath between the ring member 90 on the semiconductor wafer S and the projection 71a of the side wall 71 as represented by an arrow in Figure 16."

Applicants courteously submit that their film-forming unit as described by claim 1 patentably distinguishes over the structure taught and suggested by Lee, et al.

At this point, brief reference will be made directly back to the Office Action of January 9, 2004. Applicants note the approval of their previously-submitted proposed drawings. New corrected formal drawings are submitted concurrently herewith under cover of a separate letter.

The mis-numbering of the claims by Applicants' Amendment of November 14, 2003 has been noted. Claims 11 and 12 are re-numbered correctly herein.

Claims 1-6 stood rejected under 35 U.S.C. §102(b) as purportedly anticipated by the above-discussed patent to Lee, et al. This rejection is respectfully traversed in view of the amendment to claim 1 made hereby, and in view of the comments above. The Lee, et al. patent neither teaches nor suggests a gap-forming member that is arranged both above and overlapping a division wall.

Dependent claims 7-11 have been rejected under 35 U.S.C. §103(a) in view of JP 09-186095A to Eisuke, et al. (claim 7), JP 09-316644A to Asako, et al. (claim 8), U.S. Patent 5,400,209 to Moslehi (claim 9), and JP 09-260469A to Toshikatsu (claims 10 and 11). These rejections likewise are traversed. None of Eisuke, et al., Asako, et al., Moslehi or Toshikatsu remedies the deficiencies of Lee, et al. with respect to now-pending claim 1.

Finally, claim 12 was rejected as purportedly obvious over Lee, et al. alone, under 35 U.S.C. §103(a). This rejection likewise is traversed for the reasons stated above.

In view of the foregoing amendments and Remarks, it courteously is urged that all of the claims are allowable and that this application is in condition for allowance. Favorable action in this regard earnestly is solicited.

Respectfully submitted,

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LISTING OF CLAIMS

Claim 1. (currently amended): A film-forming unit comprising;

a processing container in which a vacuum can be created,

a stage arranged in the processing container, on which an object to be processed is placed,

a process-gas supplying means for supplying a process gas into the processing container,

a heating means for heating the object to be processed placed on the stage,

a division wall that surrounds a lateral side and a lower side of the stage,

an inert-gas supplying means for introducing an inert gas into a stage-side region surrounded by the division wall, and

a gap-forming member whose inner peripheral portion is arranged above a peripheral portion of the object to be processed placed on the stage via a first gap and whose outer peripheral portion is arranged above and overlapping the division wall via a second gap.

Claim 2. (previously presented): A film-forming unit according to claim 1, wherein:

a contact portion for pressing and fixing the peripheral portion of the object to be processed is provided at a lower surface of the inner peripheral portion of the gap-forming member.

Claim 3. (previously presented): A film-forming unit according to claim 2, wherein:

the gap-forming member is vertically movable.

Claim 4. (previously presented): A film-forming unit according to claim 2, wherein:

a plurality of contact portions are provided at a predetermined height.

Claim 5. (currently amended): A film-forming unit according to any of claims 1 to 4, wherein:

a height of the second gap defined by the division wall and the outer peripheral portion of the gap-forming member is larger than a height of the first gap defined by the peripheral portion of the object to be processed and the inner peripheral portion of the gap-forming member.

Claim 6. (currently amended): A film-forming unit according to claim 5, wherein:

the height of the second gap defined by the division wall and the outer peripheral portion of the gap-forming member is about ten times as large as the height of the first gap defined by the peripheral portion of the object to be processed and the inner peripheral portion of the gap-forming member.

Claim 7. (previously presented): A film-forming unit according to any of claims 1 to 4, wherein:

a temperature controlling means for setting a temperature of the processing container to be higher than a condensation temperature of the process gas and lower than a decomposition temperature and a reaction temperature of the process gas is provided for the processing container.

Claim 8. (previously presented): A film-forming unit according to any of claims 1 to 4, wherein:

a temperature controlling means for setting a temperature of the process-gas supplying means to be higher than a condensation temperature of the process gas and lower than a decomposition temperature and a reaction temperature of the process gas is provided for the process-gas supplying means.

Claim 9. (previously presented): A film-forming unit according to any of claims 1 to 4, wherein:

an electrostatic chuck is provided in the stage in order to fix the object to be processed placed on the stage.

Claim 10. (previously presented): A film-forming unit according to any of claims 1 to 4, wherein:

the gap-forming member is provided with a heater.

Claim ~~12~~ 11. (previously presented): A film-forming unit according to claim 10, wherein:

the gap-forming member is provided with a thermocouple.

Claim ~~13~~ 12. (currently amended): A film-forming unit according to claim 1,
wherein:

the first gap between the inner peripheral portion of the gap-forming member
and the peripheral portion of the object to be processed placed on the stage has a first
height and a first radial length,

the second gap between the outer peripheral portion of the gap-forming member
and the division wall has a second height and a second radial length,

the second height is greater than the first height, and

the second radial length is greater than the first radial length.